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FISHERY FACTS-1

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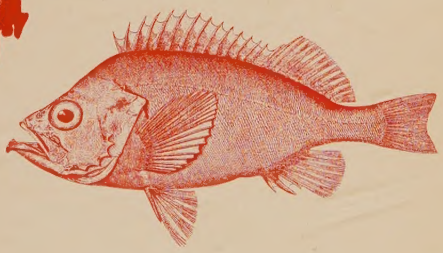
redfish



GEORGE F. KELLY
PAUL M. EARL
JOHN D. KAYLOR
FRED E. LUX
HENRY R. McAVOY
ERNEST D. McRAE

SEATTLE, WA
October 1972

NMFS Extension Publication

The major responsibilities of the National Marine Fisheries Service (NMFS) are to monitor and assess the abundance and geographic distribution of fishery resources, to understand and predict fluctuations in the quantity and distribution of these resources, and to establish levels for optimum use of the resources. NMFS is also charged with the development and implementation of policies for managing national fishing grounds, development and enforcement of domestic fisheries regulations, surveillance of foreign fishing off United States coastal waters, and the development and enforcement of international fishery agreements and policies. NMFS also assists the fishing industry through marketing service and economic analysis programs, and mortgage insurance and vessel construction subsidies. It collects, analyses, and publishes statistics on various phases of the industry.

The series Fishery Facts documents developments in research in the fishery sciences, including biology, technology, and engineering. The publications are written by scientists and other staff members of the National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

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REDFISH

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REDFISH

by
George F. Kelly, Principal Author
Paul M. Earl, Graphic art and layout
John D. Kaylor
Fred E. Lux
Henry R. McAvoy
Ernest D. McRae

INTRODUCTION

A wide variety of marine animals is harvested for food. Most, however, have been species with rapid growth and the ability to replace themselves despite intensive fishing. The redfish, or ocean perch, as a very slow-growing species, is in a different class, and its ability to withstand sustained heavy fishing remains unknown. It appears, however, that when this species is fished hard for a period of years it does not rebound as rapidly as faster-growing species such as cod and haddock. Studies currently underway should provide more certain information on this important species and furnish guidelines for planning future fishing strategy.

A market for redfish first arose in the 1930's when the developing food-freezing industry needed new resources. Earlier fishermen sought only species in demand—cod, haddock, flounders, etc.—and shunned the abundant redfish. Redfish were found to be adaptable to the new food technology of the time and have since contributed an important chapter to the history of the North Atlantic fisheries. Redfish may be one of a series of ocean species that have risen from obscurity to become an important food product and then have declined to a lower level consistent with their capacity to withstand exploitation.

It may be inevitable that the quest for new foods will lead to similar harvests of other abundant fish or invertebrates that are now ignored because they do not conform to present concepts of

food product acceptability. This brochure may help the fisherman to view with new perspective his changing role in the harvest of the ocean's crop.

FOUND IN DEEP WATER

Redfish are distributed in deep water on the continental shelf from off Cape Cod northeastward along the coasts of Maine, Nova Scotia, Newfoundland, and Labrador on the western side of the Atlantic. They also are found off Greenland, Iceland, and Norway and to the northern coast of Russia in the Barents Sea in the central and eastern Atlantic (Figure 1). The redfish range is bounded approximately by the Gulf Stream on the south and Arctic waters on the north.

Redfish are found generally at or near the bottom in depths between 30 and 350 fathoms and most abundantly between 70 and 200 fathoms. They prefer rough bottom or rocky slopes. They are found at temperatures ranging from 33° to 53°F, but the big-

Figure 1.—Range of redfish (*Sebastes marinus*) in the North Atlantic Ocean.

gest concentrations are around deeper basins and depressions where the temperature range is about 37° to 47°F.

Redfish are associated primarily with the bottom, but they have been caught on hook and line near the surface at several locations in the open ocean far beyond the edge of the continental shelf. Such catches have been frequent enough off Norway and between Newfoundland and Iceland to suggest that some numbers of large redfish may live for extended periods of time in the upper waters over the deep ocean if conditions are suitable. On the other hand, small isolated populations of redfish occur at inshore cold water locations, such as Eastport, Maine, and Hermitage Bay, Newfoundland, where conditions permit.

CATCH ROSE IN 1930'S

Redfish have supported intensive otter trawl fisheries in the North Atlantic for several North American and European countries. About 1920, large concentrations of redfish were discovered by steam trawlers in deep water along the edges of the continental shelves. Some were marketed as fresh fish, but there was little demand for them compared with the better known species such as cod, haddock and herring. Fishermen therefore usually avoided redfish.

When freezing techniques were improved about 1930, the fishing industry found redfish suitable for filleting and freezing. The modern redfish fishery began about 1935 when United States and German trawlers started landing large quantities. After a lull in fishing during World War II, landings rose rapidly as the fishing fleets grew and new redfish stocks were found on both sides of the Atlantic (Figure 2). By the late 1950's more than one billion pounds were landed each year, but landings since then have declined to about 800 million pounds a year.

GERMAN LANDINGS HIGHEST

Germany, United States and Iceland landed most of the redfish up to 1957 (Figure 3). A fleet of large Russian trawlers entered this fishery in 1957 and, for a time, landed more redfish than any other country. More recently Germany has been the leader. Canada is in second place, having increased its landings steadily since about 1965 as United States and Icelandic landings dropped. Prior

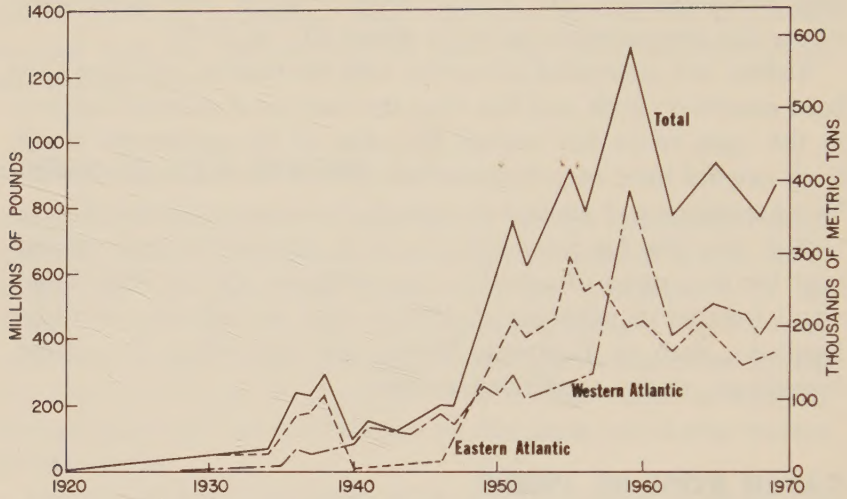

Figure 2.—Redfish landings from the entire North Atlantic Ocean and those from east and west of Cape Farewell, Greenland (44° W. Long.), 1920 to 1969.

to 1957, the greatest amounts of redfish were landed from the Icelandic banks and the region from southern Grand Bank to the Gulf of Maine. Since 1957, the coasts of Greenland and Labrador and the northern Grand Bank have been fished heavily and redfish stocks there have been reduced.

United States fishermen pioneered the redfish fishery in the Northwest Atlantic. Fishing began in the Gulf of Maine and moved eastward, working on stocks on Nova Scotia banks, in the Gulf of St. Lawrence and on Grand Bank (Figures 4 and 5). This was largely a United States fishery until about 1946 when Canada became interested in redfish around Newfoundland. In each area a similar pattern was repeated. Fishing effort increased for a few years and landings rose to a peak. Then, as the stocks were reduced by heavy fishing, catches declined in the old areas and effort was directed toward new, unfished, stocks. By 1960, most of the stocks that were within reasonable steaming distance of United States ports were showing the effects of heavy fishing. Reduced catches and high costs ruled out travel to distant areas such as the Gulf of St. Lawrence and Grand Bank. At the same time there was an ever increasing competition from Canadian and European boats fishing on those banks.

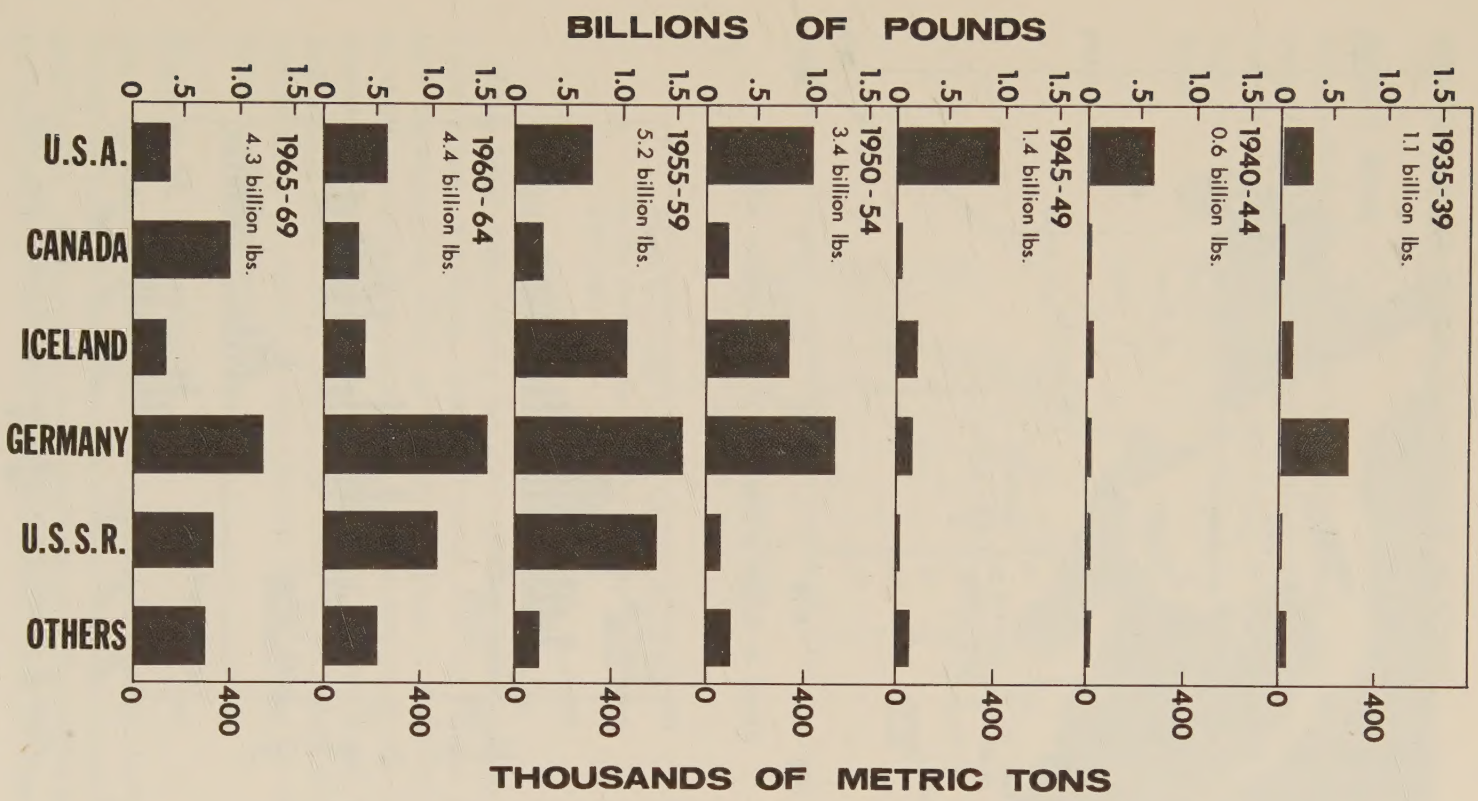

Figure 3.—Redfish landings, by country, for 5-year periods from 1935 through 1969.

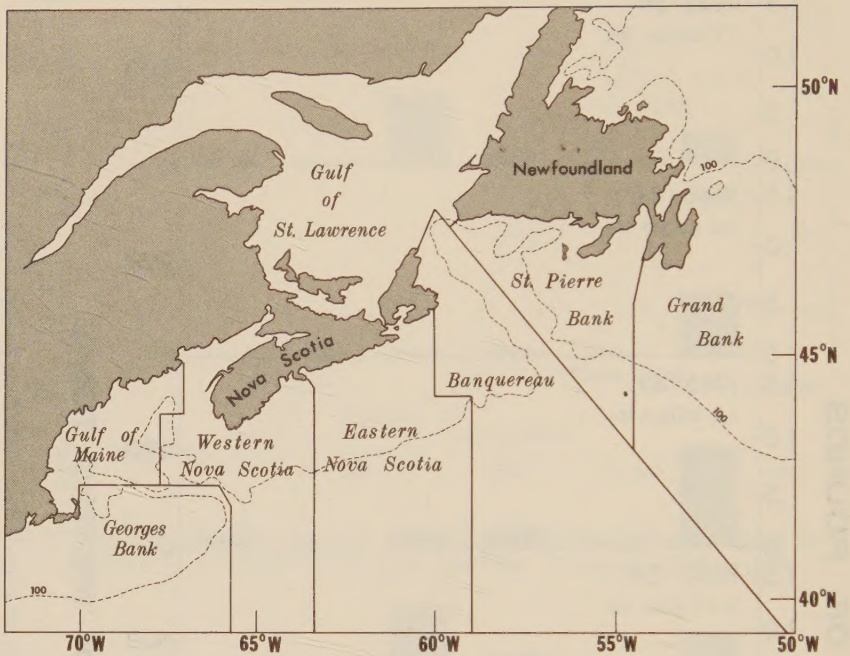

Figure 4.—Redfish fishing areas of the Northwest Atlantic.

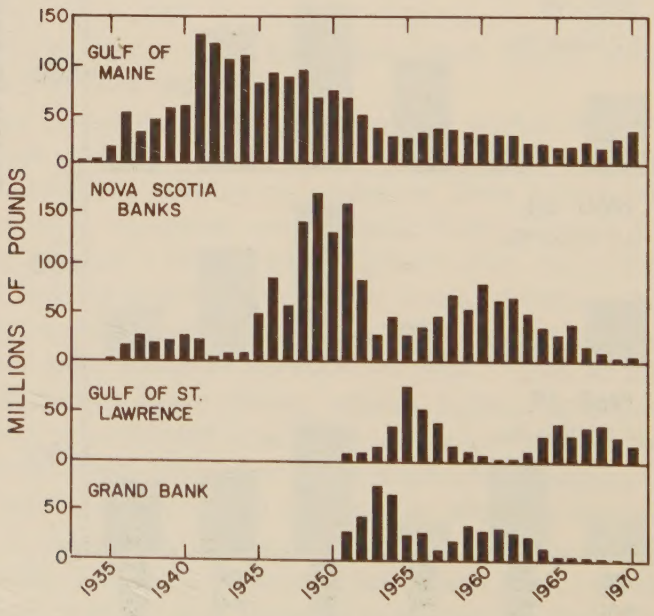

Figure 5.—United States redfish landings by fishing area, 1933 to 1970.

BEST CATCHES FROM CANADIAN WATERS

Grand Bank

Total redfish landings from the Grand Bank rose to 540 million pounds by 1959; they have since dropped, averaging 180 million pounds per year for the past nine years (Figure 6). While landings remain fairly high, some countries have reduced fishing effort there.

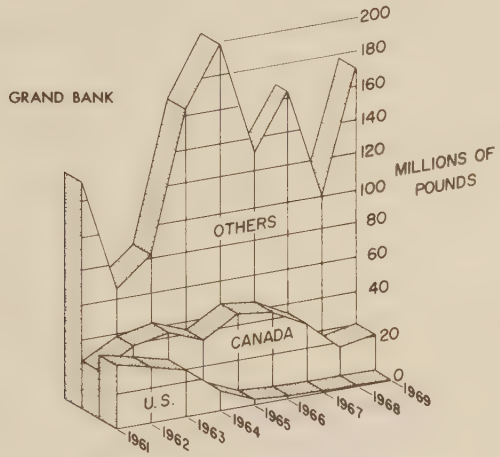

Figure 6.—Redfish landings from the Grand Bank by the United States, Canada, and other countries, 1961-1969.

Since 1960, most fishing has been by Russian, Canadian, and Polish ships. Germany, Iceland, France, and the United States have expended less effort, and redfish landings from Grand Bank by these countries have dwindled in the last five years. If United States ships were to again increase fishing on the Grand Bank, they would face strong competition from larger, more effective redfish fleets of several nations that are better suited for fishing these distant grounds.

Gulf of St. Lawrence

Since the start of the redfish fishery in the Gulf of St. Lawrence in 1951, fishing effort has been almost entirely by the United States and Canada. United States boats landed most of the redfish during the early years of this fishery; more recently, most of them have

been caught by Canadians (Figure 7). Since 1965, redfish landings from the Gulf have soared to about 200 million pounds, almost twice that landed in 1955, the initial peak catch of the early fishery.

Although fishing is good and redfish abundance is relatively high at present in the Gulf of St. Lawrence, United States boats will have difficulty in increasing fishing effort there since they will be competing with a large Canadian fleet fishing close to home. Some increase in United States effort would probably increase landings from this area, but it is likely that, as in former years, redfish abundance will decrease under the present heavy fishing pressure.

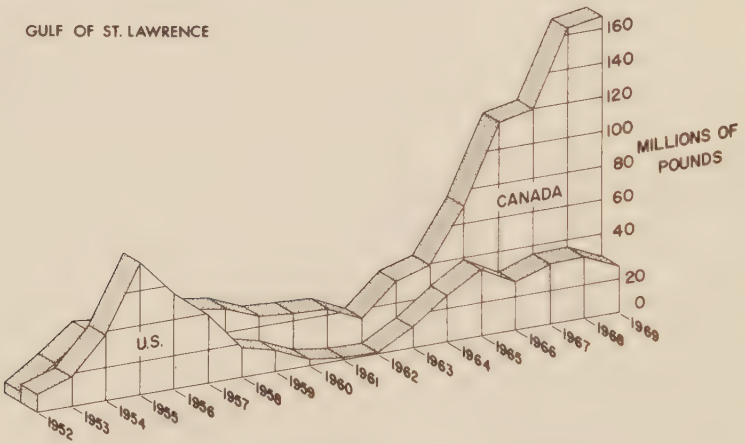

Figure 7.—Redfish landings from the Gulf of St. Lawrence by the United States and Canada, 1952-1969 (No significant landings by other countries).

Nova Scotia Banks

Redfish landings from the Nova Scotia banks rose to about 150 million pounds per year in 1948-1951, taken mostly by United States boats (Figure 8). As fishing effort was reduced in the mid-1950's, landings dropped below 30 million pounds per year. They rose again above 80 million pounds in 1960 as United States and Canadian effort increased, and remained high after Russia entered that fishery in 1962.

Since 1964, landings from the Nova Scotia banks have varied greatly from year to year with changes in effort. The United States share of the catch has declined steadily while the Canadian

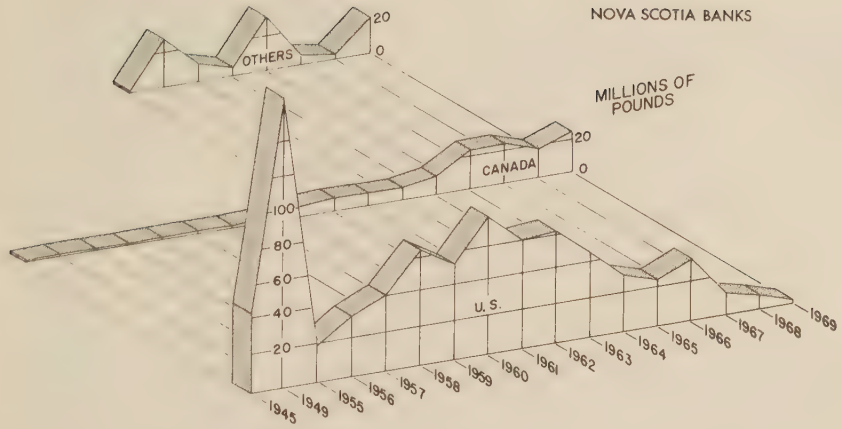

Figure 8.—Redfish landings from the Nova Scotia Banks by the United States, Canada, and other countries, 1945, 1949, and 1955-1969.

share has increased. Russia landed substantial amounts in 1963 and 1966, but their landings have been light since 1966. Poland first fished this area in 1969 and landed more than 15 million pounds of redfish.

The future of the redfish fishery on the Nova Scotia banks is uncertain. It is likely, however, that any substantial increase in redfish there will be exploited quickly by European fleets. It therefore does not appear to hold great potential for United States vessels.

GULF OF MAINE LANDINGS INCREASING

Redfish have been landed from the Gulf of Maine principally by United States boats since the start of the fishery in 1935 (Figure 9). Landings exceeded 100 million pounds a year from 1941 through 1944 and then declined steadily until 1954 as stocks were reduced and fishing effort dropped. Effort has remained low and landings have varied between 15 and 41 million pounds per year since then.

The prolonged period of reduced fishing effort since 1953 has not led to a dramatic resurgence in redfish abundance in the Gulf of Maine. Estimates of abundance from research ship samples

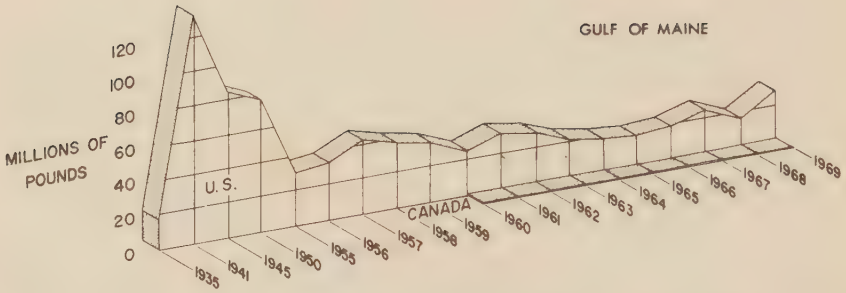

Figure 9.—Redfish landings from the Gulf of Maine by the United States and Canada, 1935, 41, 45, 50, and 1955-1969.

and commercial landings suggest that redfish have become somewhat more plentiful, but the stocks are much slower in rebuilding than biologists studying the problem had anticipated. The 35-year average annual landings from this area are about 51 million pounds, but landings have been below this level for the past 18 years.

United States redfish landings from the Gulf of Maine were higher in 1969 and 1970 than in the previous few years: 26.5 million pounds in 1969 and 34.3 million pounds in 1970. It is likely that increased fishing effort there may harvest between 40 and 50 million pounds per year for a few years. The best prospects for fishing are around the deep, rocky edges of the western basin of the Gulf where redfish stocks were concentrated in the early days of the fishery (Figure 10). The best redfish habitat is around Cashes and Fippennies, off Mt. Desert and Monhegan Islands, around Jeffreys Ledge, and off the Highlands of Cape Cod.

The Gulf of Maine redfish fishery has been plagued in the past with the presence of an external copepod parasite, *Sphyrion lumpi*, that attaches to the fish and spoils the texture of the fillets. The parasite is found only on redfish from the Gulf of Maine and off Labrador. In the early days of the fishery in the Gulf of Maine, the industry handled great quantities of parasitized fish by routinely cutting the parasites from the fillets as they passed over a lighted panel on the fillet table. Despite a high degree of infestation in fish from certain areas, processors removed the parasites from the fillets to the satisfaction of the fish inspectors and the consumers.

Examination of Gulf of Maine redfish from *Albatross IV* catches in late 1970 has shown the incidence of parasites to be the lowest

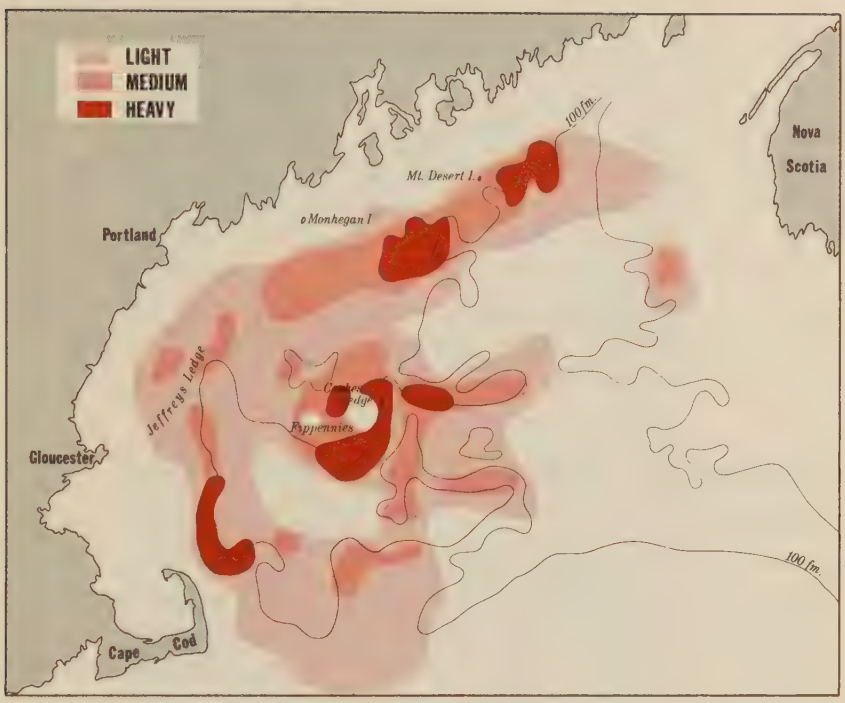

Figure 10.—Distribution of United States redfish fishing effort in the Gulf of Maine, 1942-1948.

since observations were begun in 1942. Boat skippers and dealers also report a reduction in parasites. Why parasites are fewer now is unknown; hopefully, however, this costly problem of the past will be only a minor annoyance in the future.

BEAR LIVE YOUNG

Redfish give birth to live young, an unusual feature which makes it an unlikely species for continuous, intensive harvesting in a commercial fishery. Fertilization, incubation and hatching of the eggs all occur within the female's body. In the Gulf of Maine, incubation requires 45 to 60 days, and the young are released from the mother in May and June. Ripe females, however, can be found there from April until September.

The number of young produced is small compared with egg-laying fish. A 12-inch female contains about 50 thousand fertilized eggs when incubation begins. The average number of live fry released at the time of hatching is 15 to 20 thousand. The

newly hatched, well developed fry rise to very near the surface where they drift with the currents.

The fry can swim well at birth. They are soon able to forage for planktonic food. Their rate of survival appears to be high compared with that of egg-laying fish. The young redfish stay in the upper waters feeding on small crustaceans until they are about two inches long, before settling to the bottom in the fall. During the midwater phase, the young fish are marked with patches of black and green pigment (Figure 11). Red pigment does not develop until after they move to the bottom and begin to feed on larger invertebrates and small fish.

OVER 20 YEARS OLD

Redfish grow much slower than most fishes of this area and they are very long-lived. The young grow to about three inches in their first year. Growth then slows to an inch or so a year until about age ten, the time when they first spawn. The growth rate of many individuals slows further after they begin spawning. The largest Gulf of Maine redfish are about 18 inches long, 3 pounds in weight, and over 20 years old.

CAUGHT MOSTLY IN DAYTIME

Redfish are close to the bottom during daylight hours, and they apparently rise up above the bottom during the night. Fishermen report that their echo traces show them coming up off the bottom at dusk. This vertical movement seems to be related to feeding since this fish feeds primarily at night and on the kinds of shrimp that are found above the bottom. Fishing therefore is limited largely to daylight hours.

There are some exceptions to this, however, such as in the Gulf of St. Lawrence where redfish also are caught at night in some numbers. This may be due to the unusual temperature conditions there where a middle layer of cold water of about 32°F overlies the warmer bottom water of deep channels where the redfish are caught. The layer appears to serve as a barrier to upward movement and the fish therefore are more closely confined to the bottom.

Figure 11.—Young of the year redfish caught in midwater in late summer are silvery green with blotches of black.

TAGGING SUCCESSFUL INSHORE

Studies of live redfish have been difficult because the fish usually die when brought up from the depths where they normally live on the commercial fishing grounds. Successful tagging of offshore

fish therefore has been impossible. Tagging and observation of the behavior of live fish was accomplished first in 1956 with the discovery of a shallow-water population of redfish in the harbor at Eastport, Maine. More than 5 thousand redfish were caught at the surface on hook and line and were tagged with good results. These fish have moved very little, if at all, and over a period of years hundreds of tagged individuals have been recaught and returned to the water several times. One 8-inch fish that was tagged in 1956 was recaught for the third time in 1970. It had grown less than an inch in length in the 14-year period.

The behavior of redfish at Eastport appears to be similar to that of the fish on the commercial grounds. The fish settle in the deep water of the harbor during the day and move inshore around the docks at night to feed on the swarms of shrimp at the surface.

TRAWLS MODIFIED FOR REDFISH

Bottom otter trawls take most of the redfish. Nets modeled after the Granton, Yankee No. 41, and No. 41-A trawls have been used by United States fishermen since the beginning of this fishery.[1] Redfish nets differ from 41 and 41-A groundfish nets mainly in mesh size and in length of the extension piece. Nets currently in use usually have 4½ inch mesh twine forward of the cod-end and 2½ inch mesh in the cod-end.

Redfish behavior has led to a number of modifications to gear that are unique to this fishery. On bright days redfish often are concentrated on or near to the bottom; on cloudy days, however, they may rise some distance above the bottom and beyond the reach of regular groundfish nets. To raise the net opening to reach higher fish concentrations, fishermen usually buoy the headrope with 70 or so floats. The highly buoyed nets may only be in light contact with the bottom when fishing. This probably saves gear since redfish frequently occur over rough ground where normal bottom trawling is risky.

GEAR RIGGED FOR ROCKY BOTTOM

Fishermen also have a gear modification for fishing around rocky ridges where good redfish catches can at times be made. For this,

[1] Details of construction are omitted but are available from National Marine Fisheries Service, Engineering and Vessel Operations Unit, Woods Hole, Massachusetts 02543, or phone (617)-548-5123 in Woods Hole.

two or three iron shoes are added to the trawl doors and less than the usual amount of trawl wire is used with the heavier doors. In this way, the heavy doors tend the bottom, but if they hit into a ridge, the pull is somewhat upward. This helps to keep the doors from digging in and parting wire. This arrangement, fished in combination with extra headrope floats, also works well over mud and rock bottoms where redfish concentrations are sometimes found. Many fishermen have abandoned the effort to keep lower wings mended, since the rough bottom fished for redfish usually tears them out. Some nets are built with a jib omitted from the lower front end of the lower wing. In addition, cheaper, manila bottom bellies are often used to reduce twine replacement costs.

Midwater trawls, off-the-bottom trawls, and high-opening bottom trawls all have some potential for catching redfish that are above the reach of regular bottom trawls (Figure 12). A major drawback to midwater gear is that it is generally light and will not survive if it touches the hard bottom. In addition, these nets are very long and vessels must be large in order to handle them effectively.

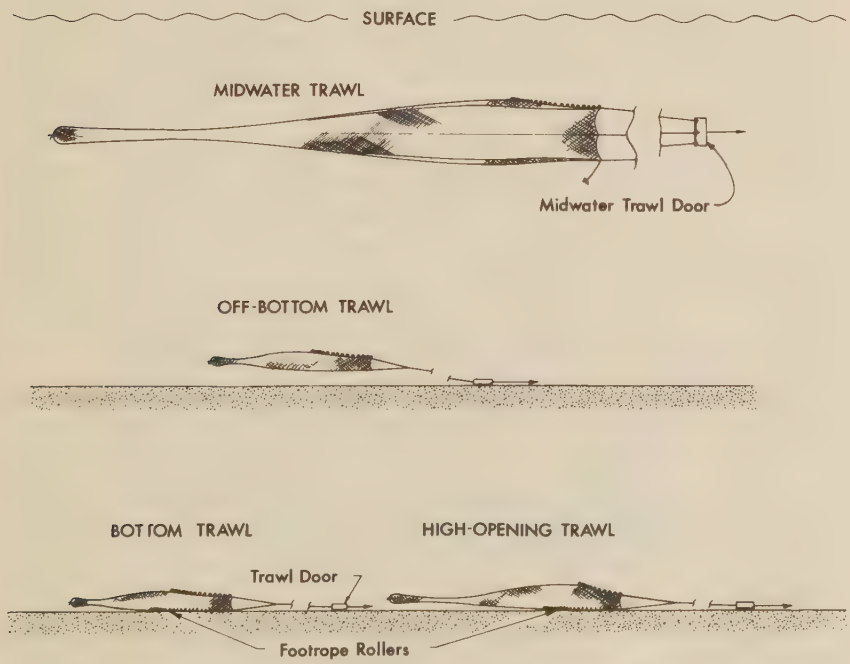

Figure 12.—Sketches of some types of trawls.

Off-the-bottom trawls, also, are susceptible to damage if they should contact hard bottom; when rigged to survive contact with hard bottom, they may be too heavy to fish properly above the bottom. Neither these nets nor midwater trawls have been particularly successful or have had wide industry acceptance.

High-opening trawls appear to hold the greatest potential for increasing the efficiency of trawling for redfish. A well designed high-opening trawl, with no loose twine to snag on rough bottom, should give greater redfish catches than nets now in use. The Atlantic Western trawl is a high-opening net available in New England that could be adapted to use for redfish.

GOOD MARKET DEMAND

Redfish, marketed as ocean perch, has been a popular food in the United States for about 35 years. The best markets have been in the midwest and south where it has been eaten primarily by low income families. Markets have been poor for this fish in the northeast and west because of the availability of a wide variety of local marine species. The present public awareness of the nutritional value of fish, coupled with the decreasing supplies and rising prices of many North Atlantic species, may improve the prospects for expanding and strengthening the markets for ocean perch products, particularly in medium and high income groups. Recent test marketing of ocean perch products in New York City and Pittsburgh have shown encouraging results.

Market demand in the past has been greatest for frozen fillets with the skin on. Skinless fillets are not popular because they have a short storage life when frozen. Recently, skin-on fillets that have been breaded and individually quick-frozen have gained in popularity. There has been little demand for fresh fillets in the past, but this market has good potential for growth.

As United States landings of redfish declined, imports increased to the extent that we now import substantially more than we produce at home (Figure 13). Fillet imports in 1969 were almost triple those of 1954. In recent years more than 90 percent have come from Canada. Ocean perch is imported primarily as fillets and has replaced cod as the major groundfish fillet imported (Figure 14).

In view of the present firm demand for ocean perch, it appears that markets could be further expanded. One way to do this might lie in marketing ocean perch in more varied forms as is practiced

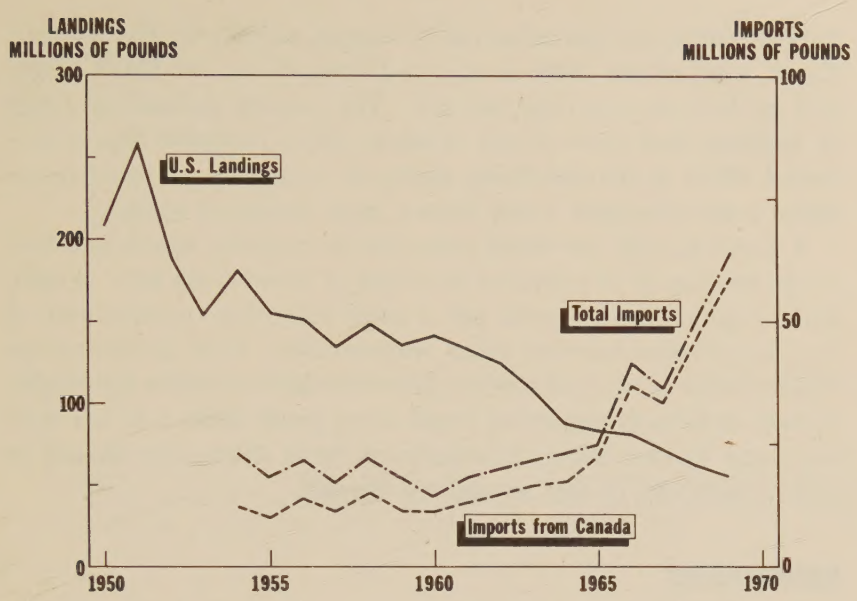

Figure 13.—United States redfish landings and imports of ocean perch fillets, 1954-1969. (Fillet weights plotted on scale 3 times that of round weights of fish for comparative purposes.)

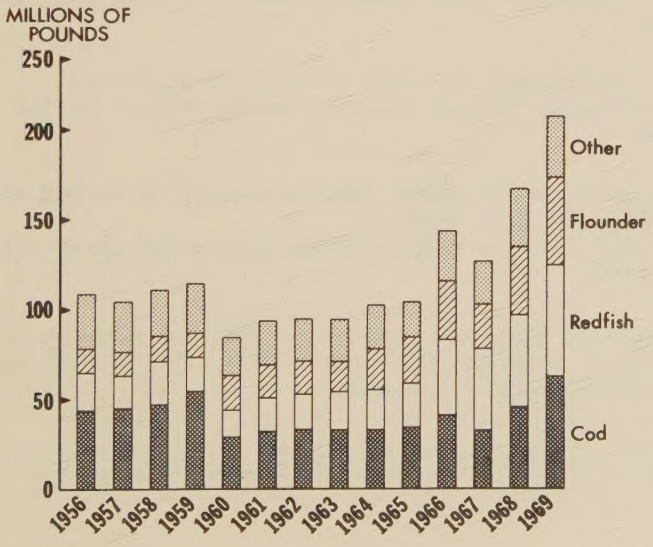

Figure 14.—Imports of groundfish fillets and steaks, by species, 1956-1969.

in West Germany, the principal European market for this species. There, most of the catch is sold as frozen fillets, but fresh, salted and smoked products are popular. The present reduced landings of haddock and other North Atlantic fishes suggests that a concerted effort to market fresh, partially prepared, or ready-to-eat ocean perch products would have a good chance of success.

A wider market for fresh ocean perch probably could be established because of the present shortage of other fresh fish. Fresh, high quality, fillets should get a good reception, particularly at long established markets from western New York to Minnesota where frozen ocean perch fillets first were introduced in the 1930's. Canada is already exporting fresh ocean perch fillets into the midwest and United States producers of fresh fillets also should be able to compete in this expanding market.

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[2] For additional information on literature, write to National Marine Fisheries Service, Northeast Fisheries Center, Woods Hole, Massachusetts 02543, or phone (617)-548-5123 in Woods Hole.

This publication is the second in a series on the Northwest Atlantic Fisheries.

Resource Report No. 1. Pollock, 12 p.
Fishery Facts—1. Redfish, by George F. Kelly, Paul M. Earl, John D. Kaylor, Fred E. Lux, Henry R. McAvoy, and Ernest D. McRae, NMFS Extension Publication, 18 p. Seattle, WA, October 1972.

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